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(54) Auxiliary endless track mechanism for automobiles

(57) An automobile is provided with an auxiliary endless-track mechanism to enable it to run easily in adverse conditions, to stop very abruptly and to turn in a small space. The endless tracks (7), which may be of rubber with gripping projections, are mounted on a tubular frame which is extendable and retractable eg by hydraulic cylinder (120) towards and away from the ground. Drive to the tracks may be taken from the output shaft (14) of the main transmission (12) by means of bevel gears (17 etc.) and shafts which ultimately drive the track sprockets. The endless-track frame can be rotated about a vertical axis relative to the automobile by an electric motor for tight turns. The endless tracks may extend in response to the sensing of high pressure in the hydraulic wheel braking system.

Fig. 2

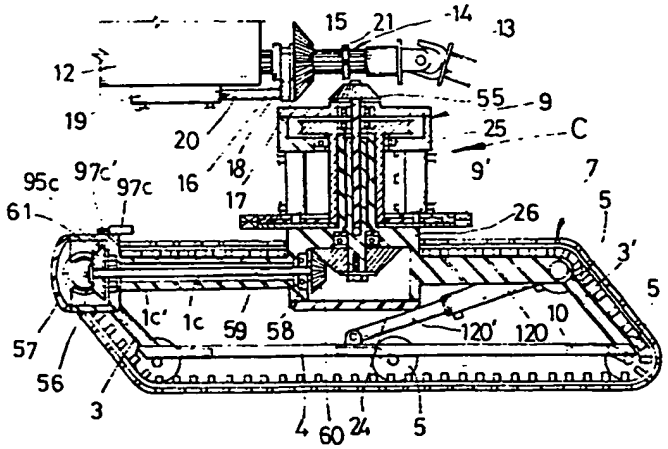
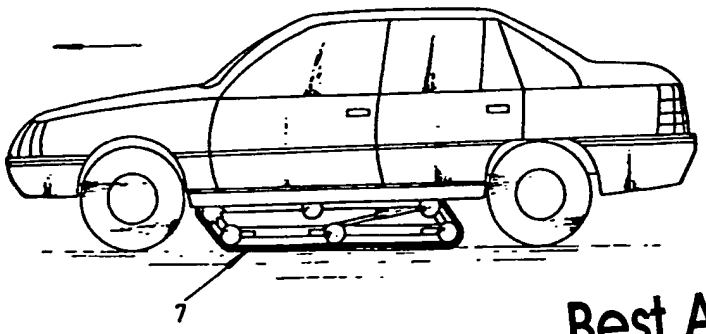


Fig. 18



GB 2 248 428 A

Fig. 1

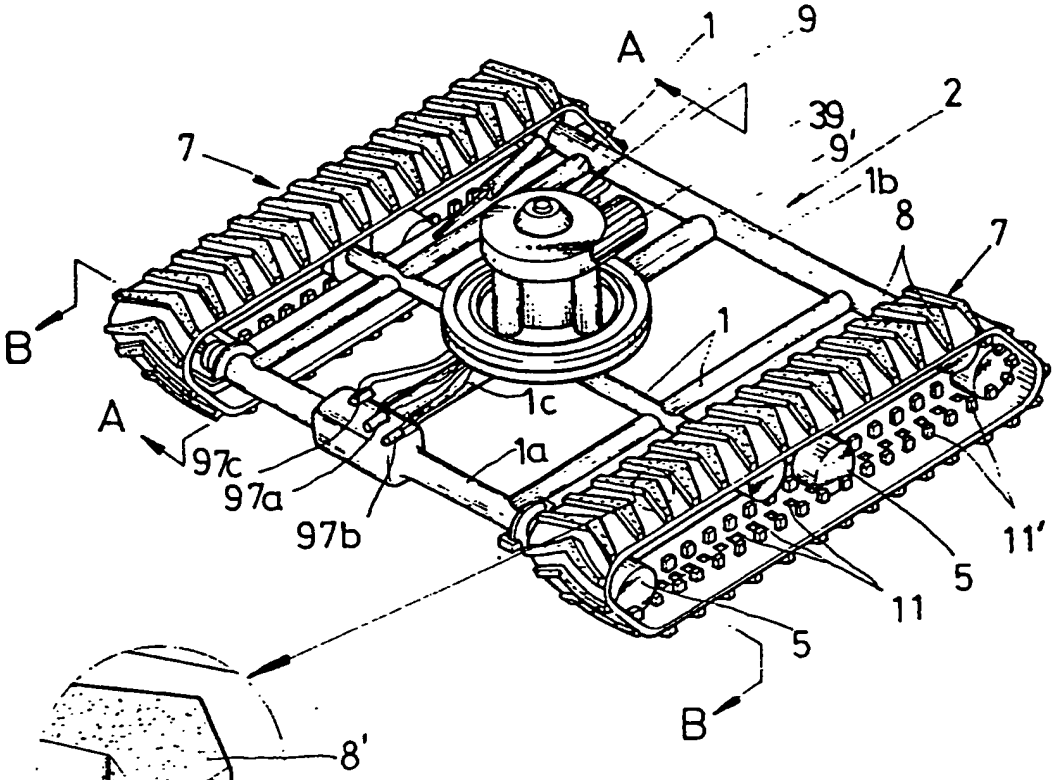

A
1
9
39
9'
2
7
1b
8
7
B
1
1c
A
97c
1a
97a
97b
11'
5
11
5
B
8'

Fig. 2

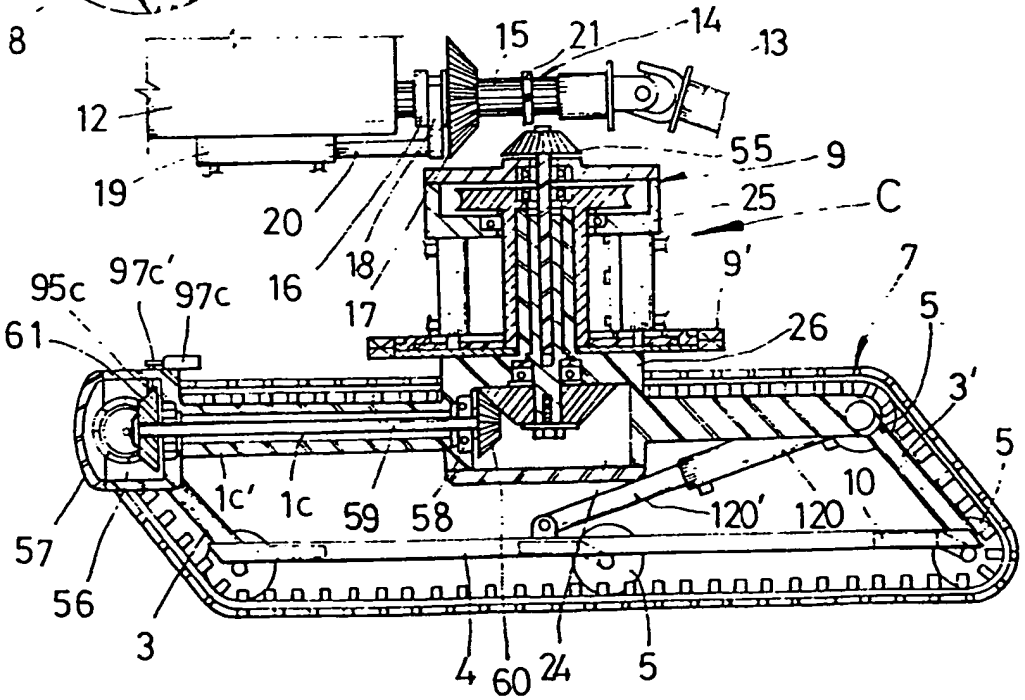
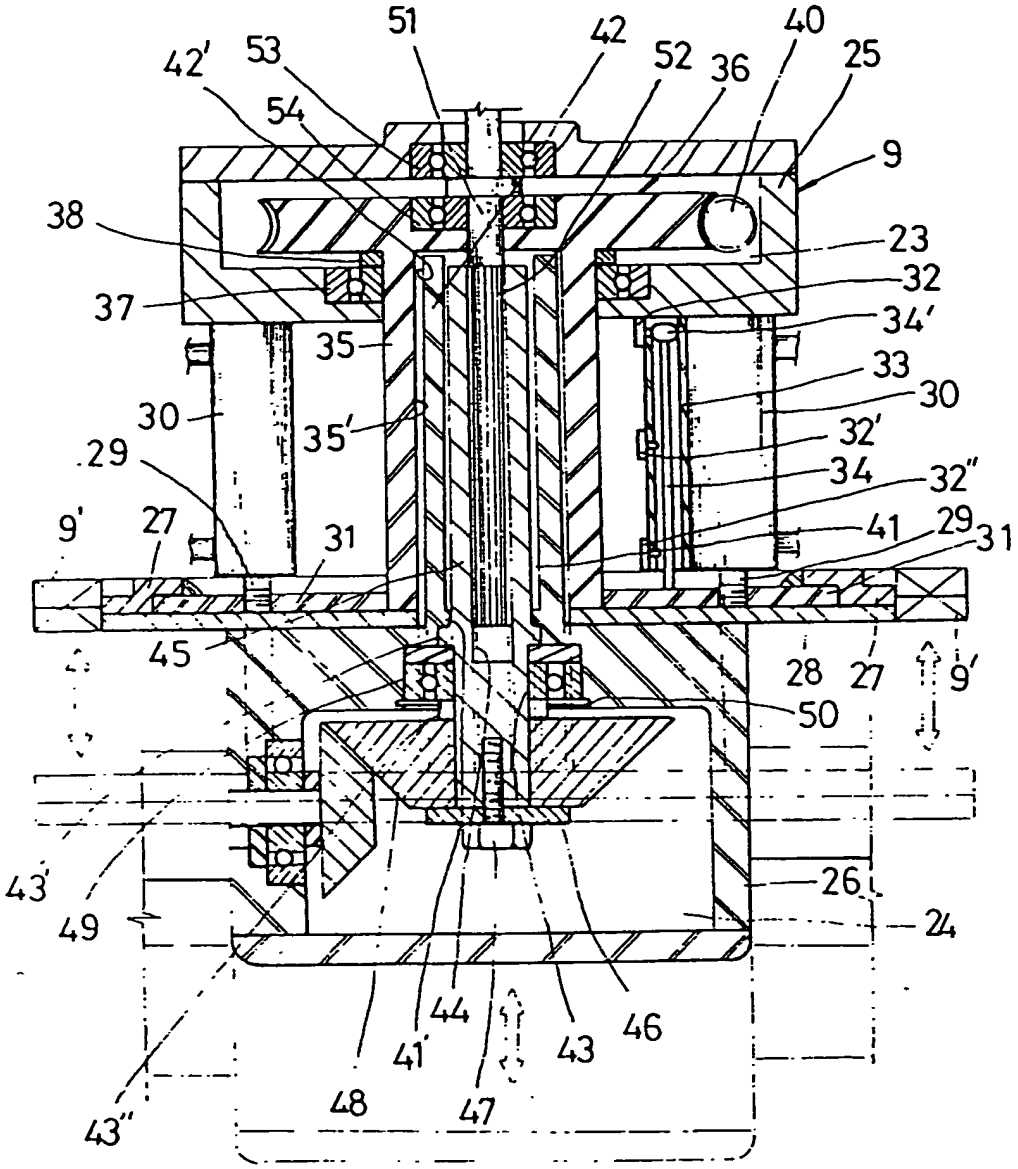

8
15
21
14
13
12
55
9
19
25
C
20
9'
7
95c
97c'
97c
16
18
17
5
61
26
3'
5
1c'
1c
59
58
120'
120
10
57
56
3
4
60
24
5

Fig. 3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42
40
42'
53
52
36
25
54
9
38
23
32
37
34'
35
33
30
30
35'
32'
29
34
32"
9'
27
31
41
29
31
45
28
27
9'
50
43'
26
49
24
44
46
41'
43
48
47
43"

Fig. 4

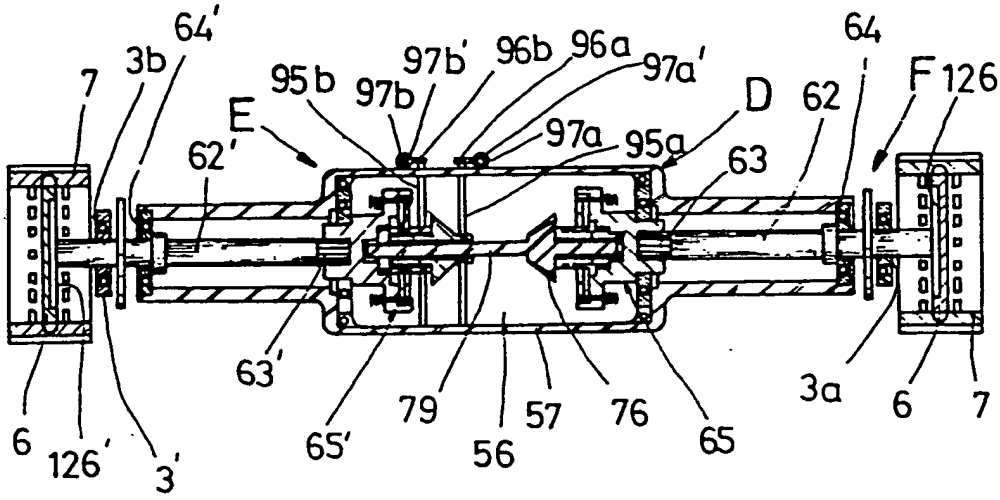
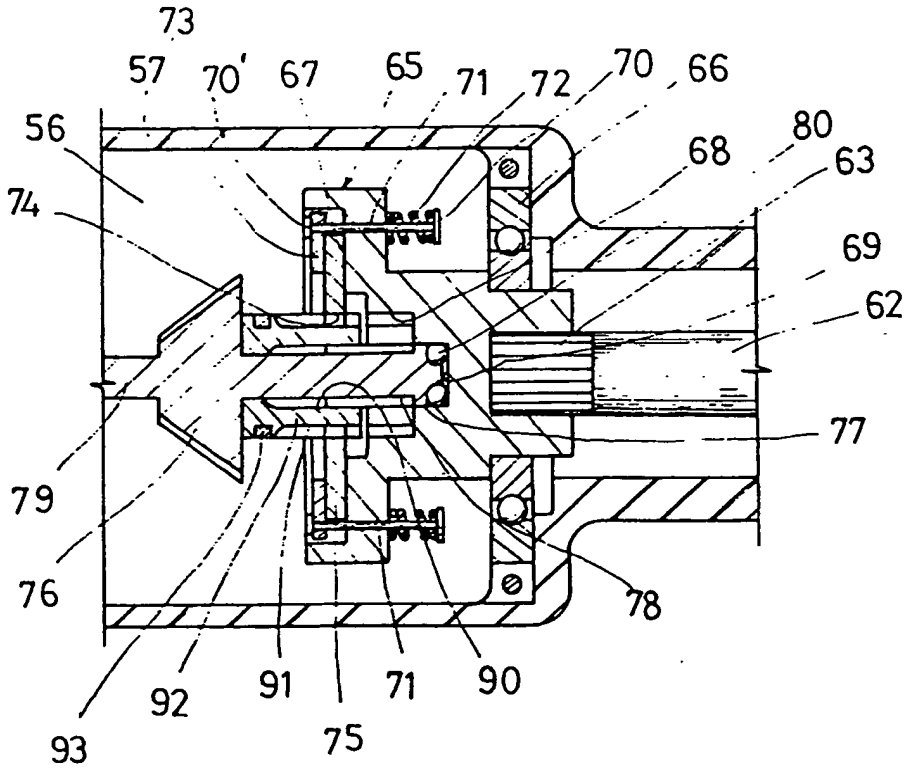

64'
3b
7
95b
97b'
96b
96a
97a'
64
F
126
E
97b
D
62
62'
97a
95a
63
63'
79
57
76
65
3a
6
7
6
126'
3'
65'
56

Fig. 5


73
57
70'
67
65
71
72
70
66
56
80
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63
74
69
62
77
79
76
78
92
91
71
90
93
75

Fig. 6

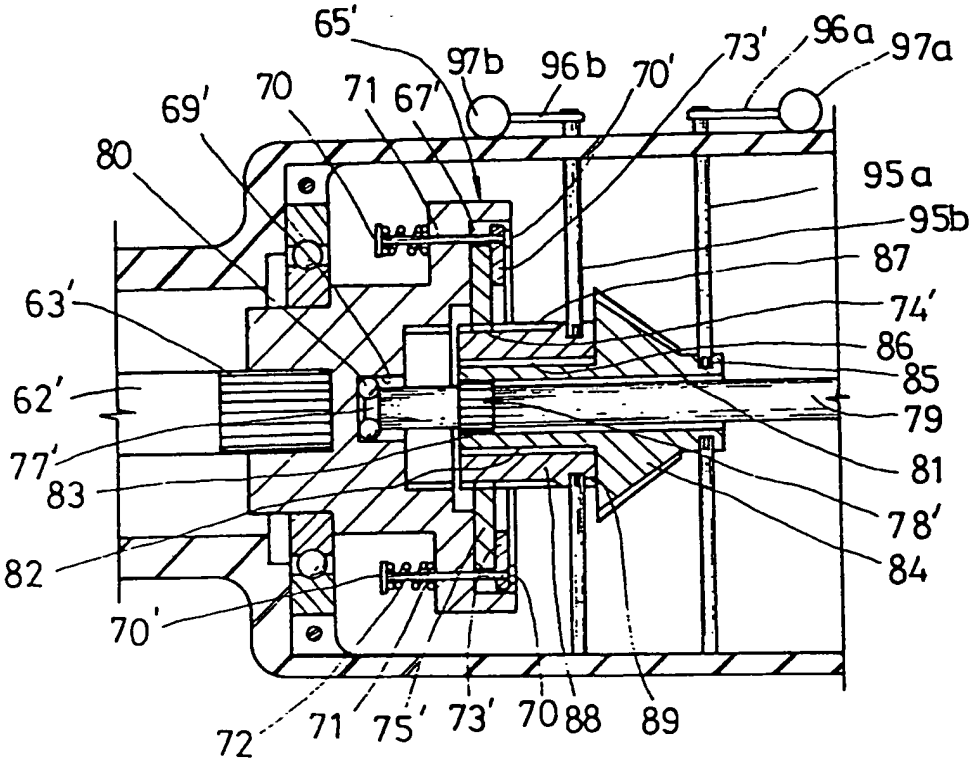

65'
97b
96b
70'
73'
96a
97a
69'
70
71
67'
80
95a
95b
87
63'
74'
86
62'
85
79
77'
81
83
78'
82
84
70'
72
71
75'
73'
70
88
89

Fig. 7

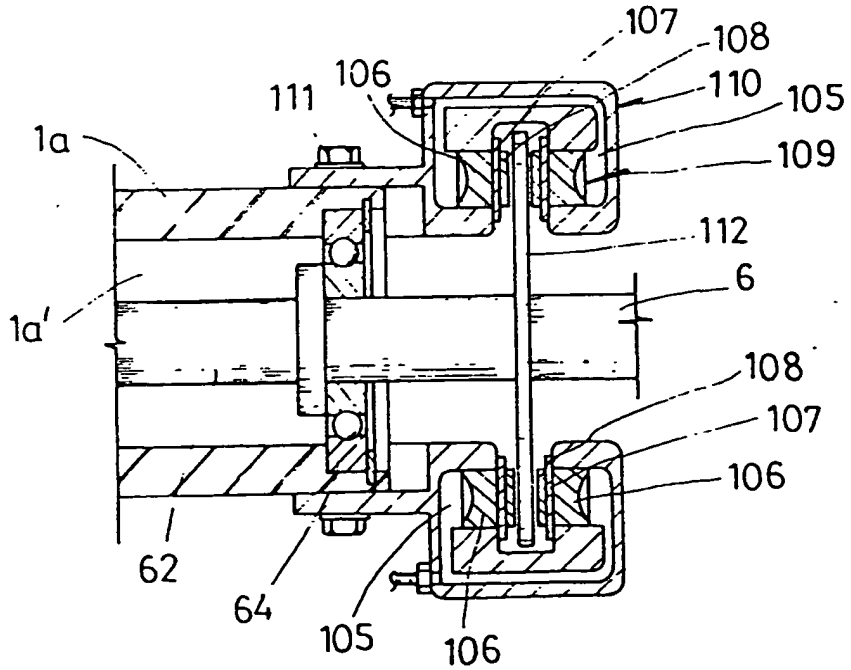

107
108
106
110
111
105
1a
109
112
6
1a'
108
107
106
62
64
105
106

Fig. 8

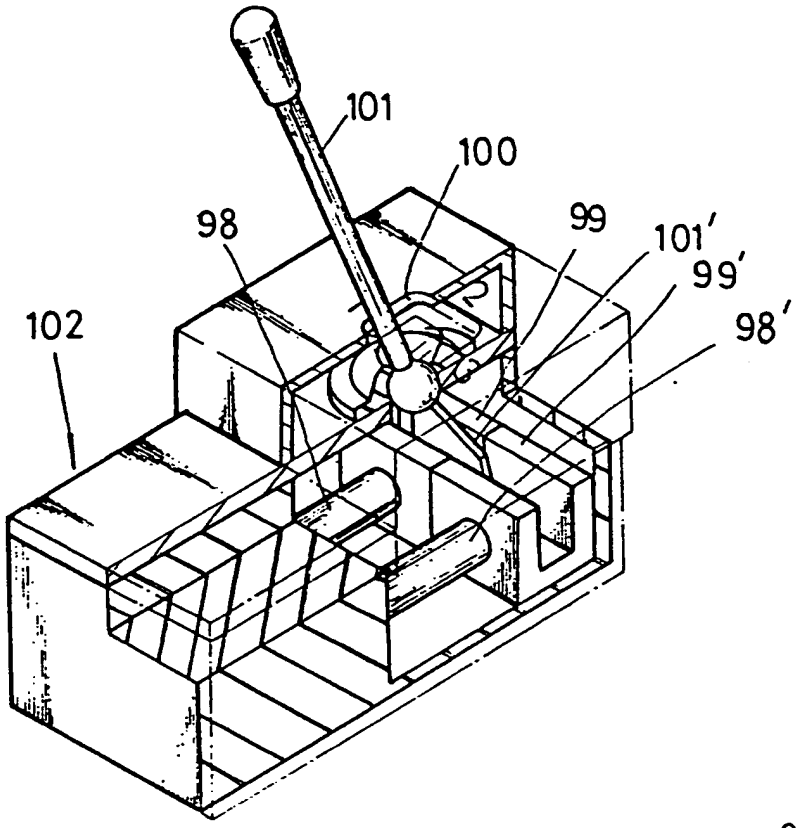

101
100
98
99
101'
99'
98'
102

Fig. 9

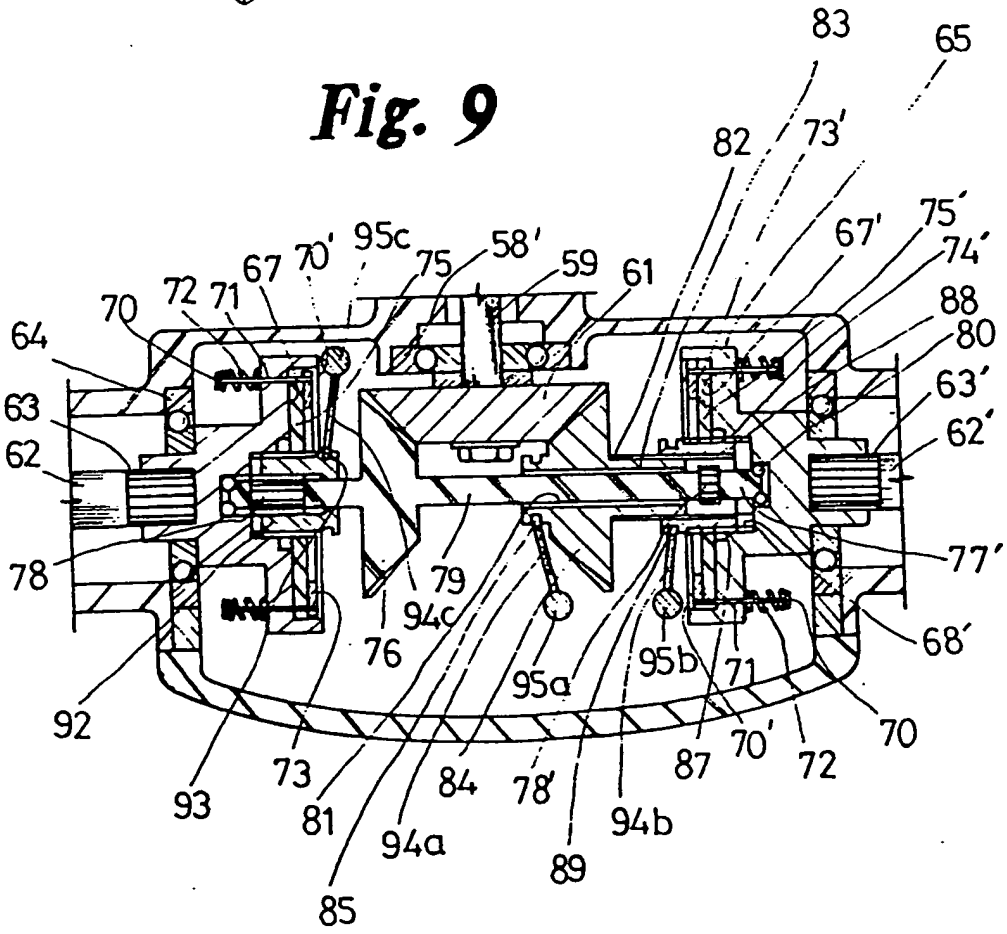

83
65
82
73'
75'
67'
74'
95c
70'
67
75
58'
59
61
72
71
70
88
80
64
63'
63
62'
62
77'
78
79
94c
68'
76
95a
95b
71
92
70
70'
72
87
73
84
78'
93
81
94a
94b
89
85

Fig. 10

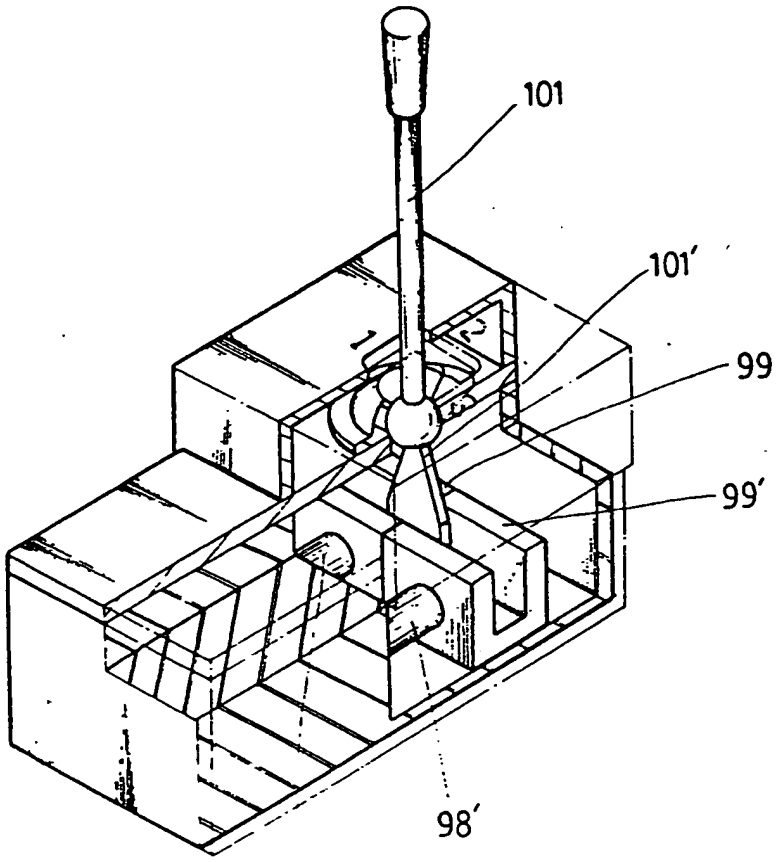

101
101'
99
99'
98'
98

Fig. 11

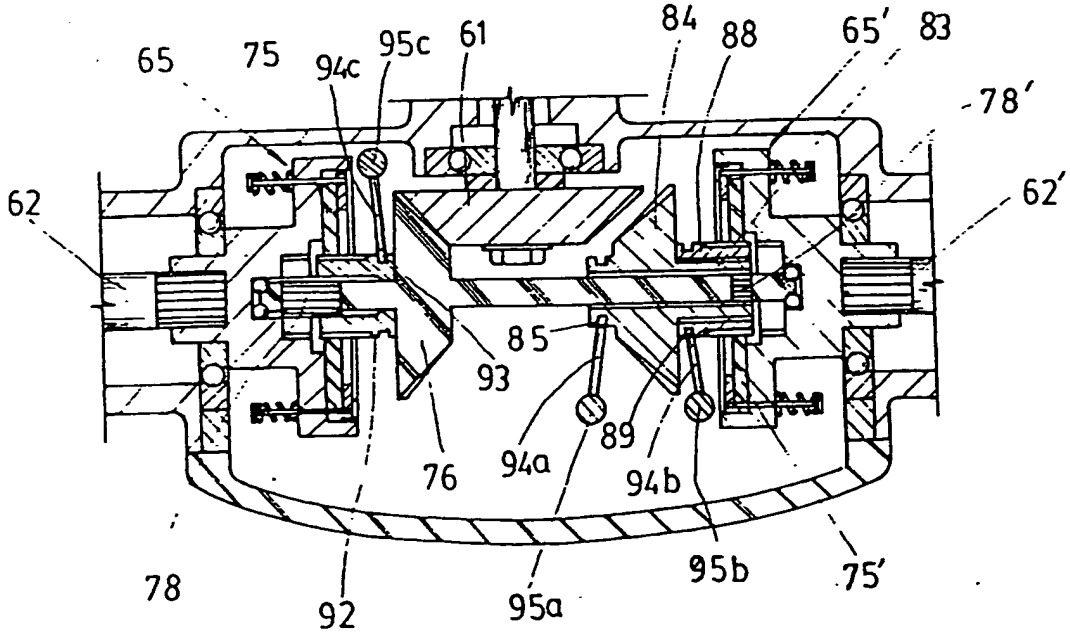

65
75
94c
95c
61
84
88
65'
83
78'
62
62'
85
93
89
94a
94b
76
78
92
95a
95b
75'

Fig. 12

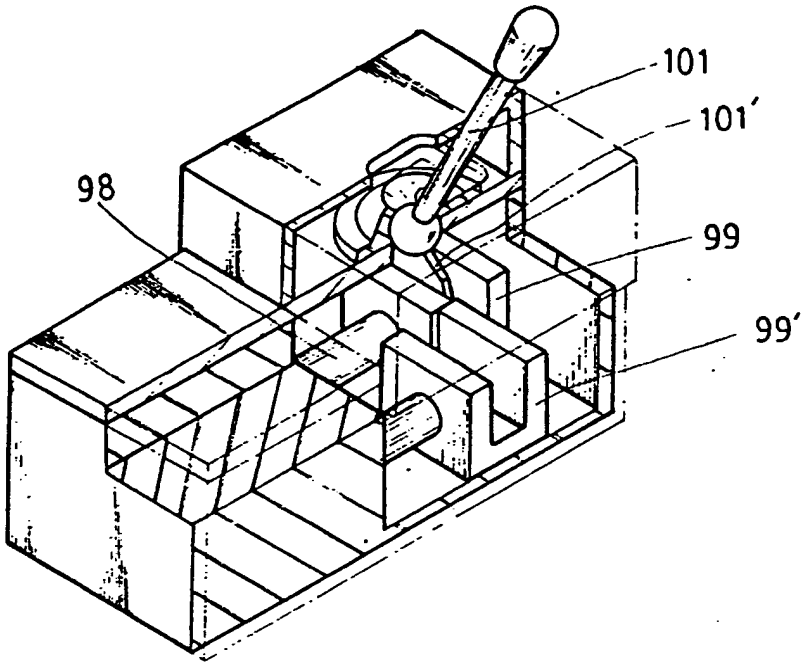

101
101'
98
99
99'

Fig. 13

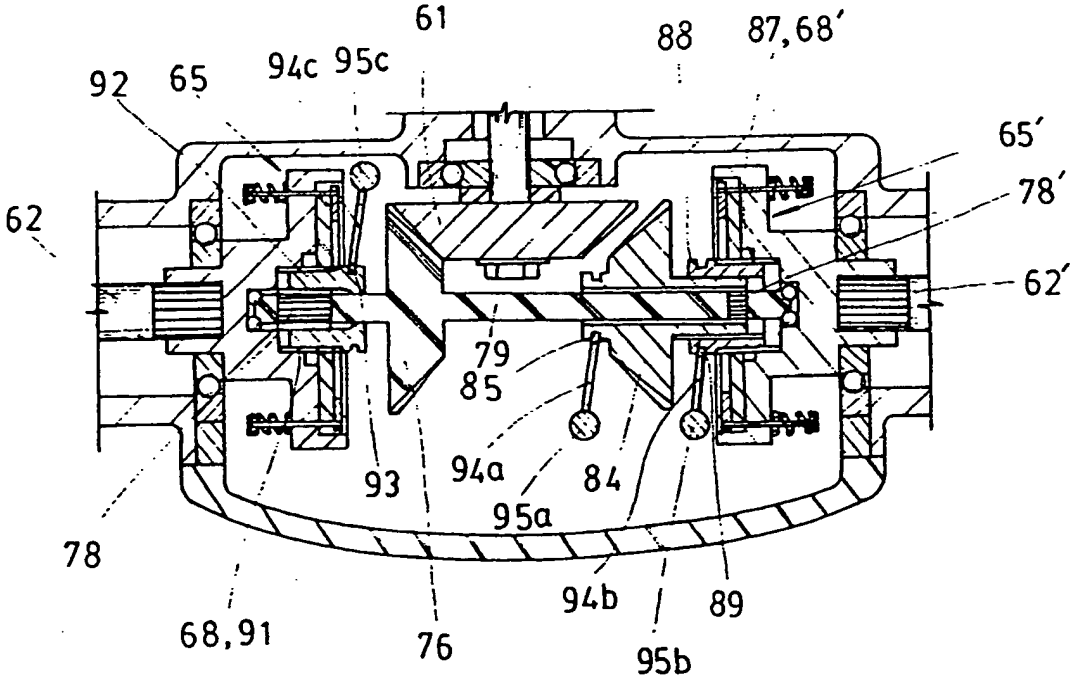

61
88
87,68'
92
65
94c
95c
65'
78'
62
62'
79
85
94a
84
93
95a
78
94b
89
68,91
76
95b

Fig. 14

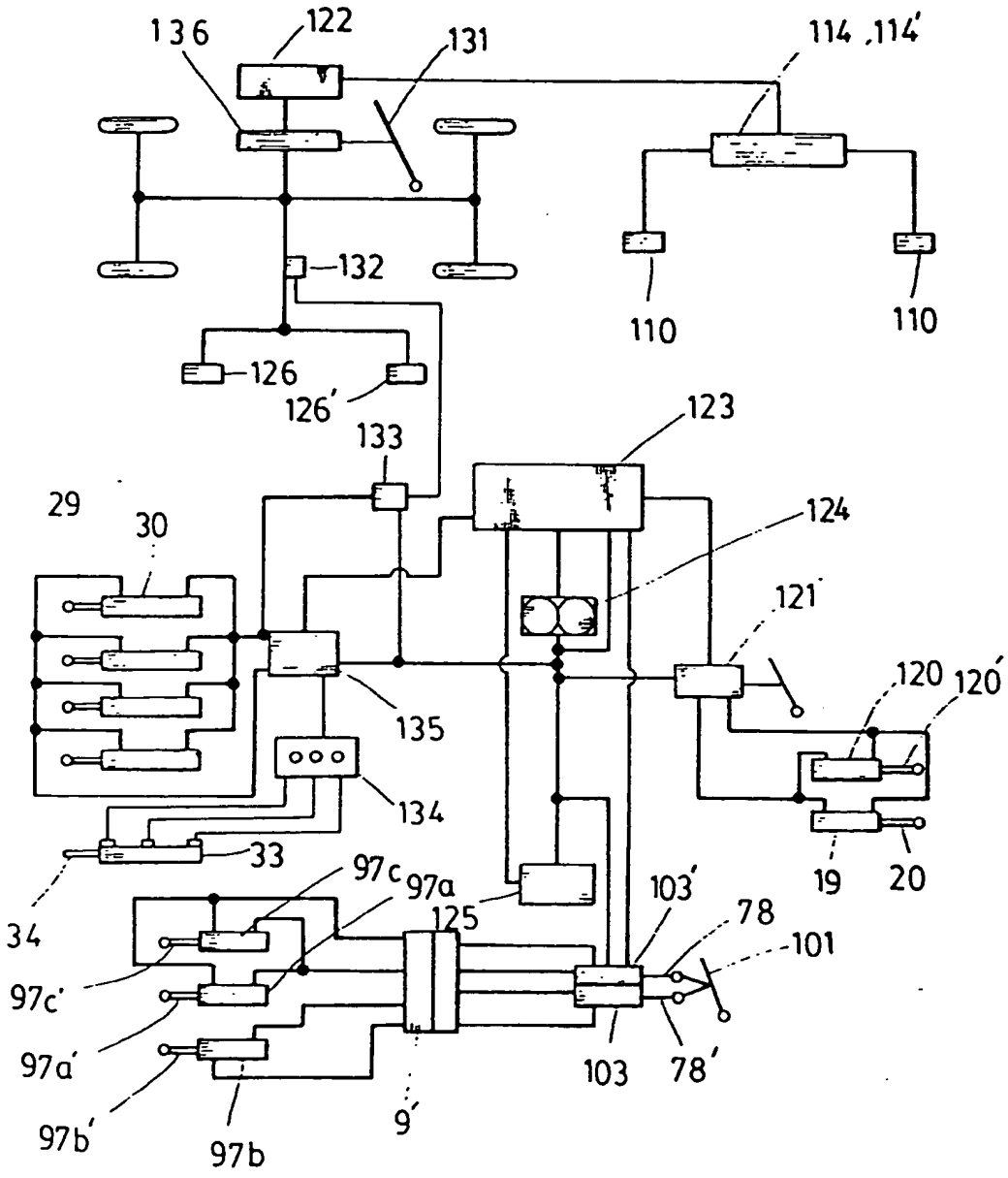

136
122
131
114
114'
132
110
110
126
126'
133
123
29
30
124
121
120
120'
135
134
33
34
19
20
97c
97a
125
103'
78
101
97c'
97a'
97b'
97b
9'
103
78'

Fig. 15

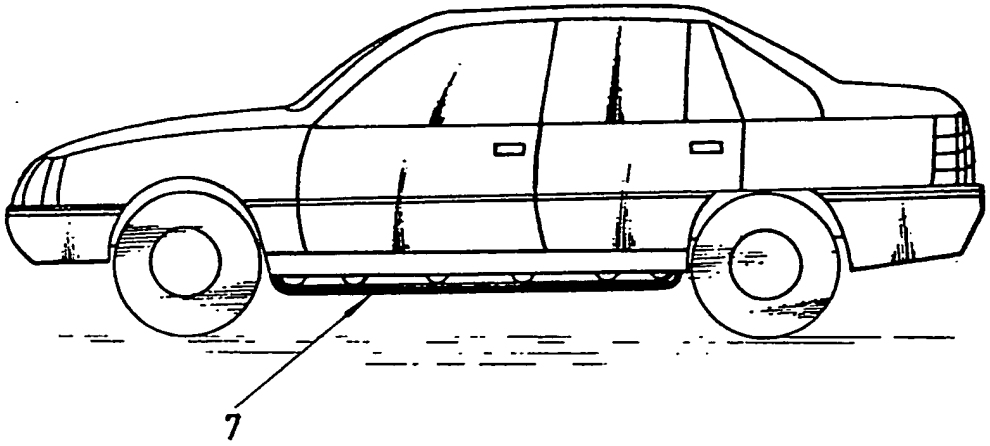


Fig. 16

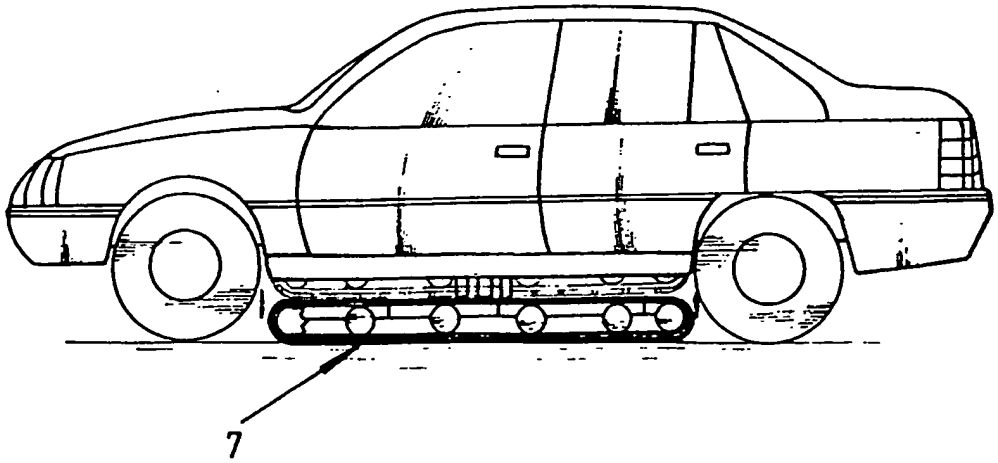


Fig. 17

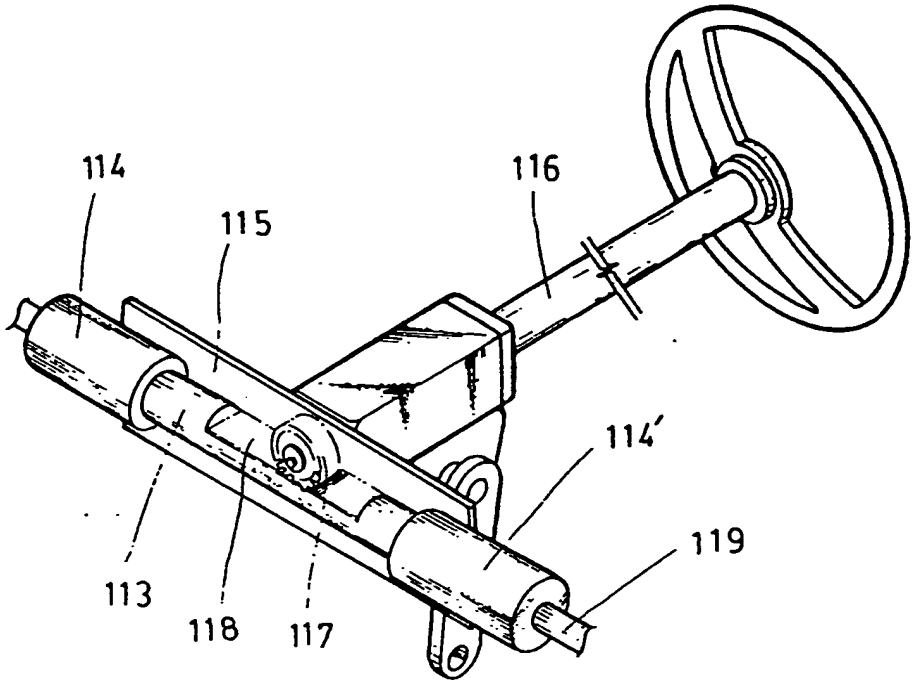


Fig. 18

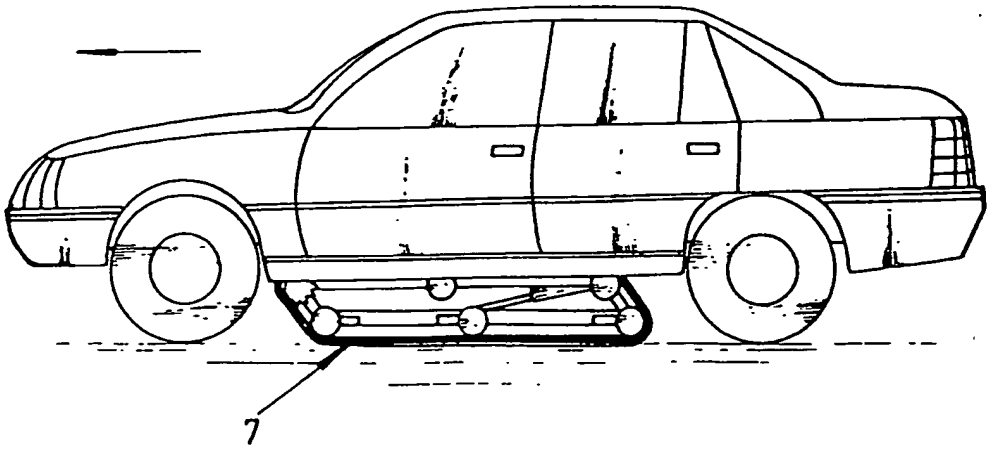
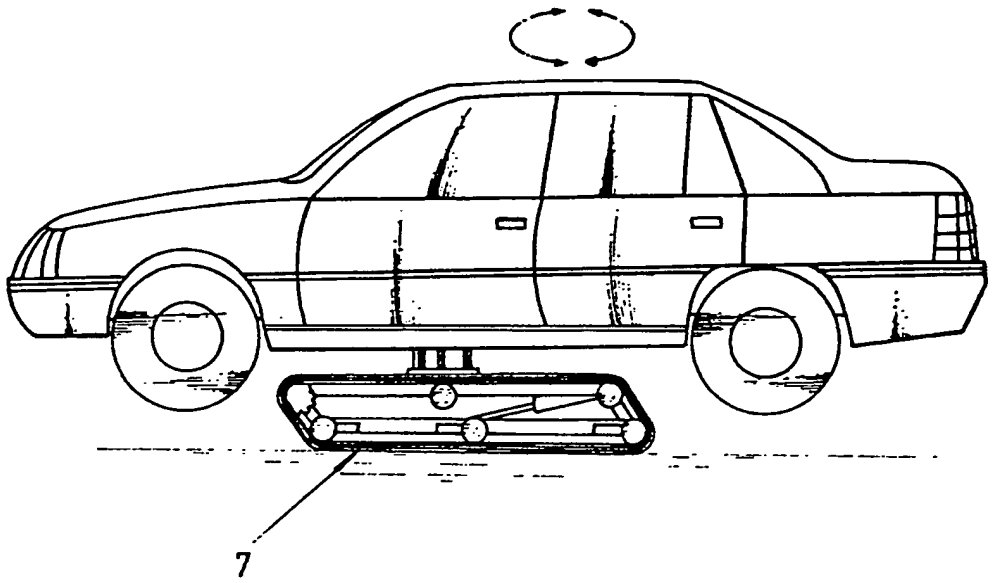


Fig. 19



TITLE OF THE INVENTION

MULTIPURPOSE AUXILIARY TRACK MECHANISM FOR AUTOMOBILE

FIELD OF THE INVENTION

The present invention relates to a multipurpose auxiliary track mechanism for automobile, which is installed at a proper place on the lower frame of an automobile, and which is provided with an extending/contracting means utilizing the output power of the output shaft of the automatic transmission, and a separate motor and a separate hydraulic system, so that there should be provided an auxiliary braking function, an auxiliary running function and an auxiliary turning function, that the safe running of the automobile should be assured, that the running of an automobile should be possible even on a muddy road or on a road filled with adverse conditions such as steep slope of the road or narrowness of the road, and that left or right turnings of the automobile should be possible even in a narrow space as long as the turning radius is secured.

BACKGROUND OF THE INVENTION

The currently mass-produced automobiles have various problems in their driving safety, and the major problems will be described below.

First, all the currently running automobiles are provided with braking mechanisms either mechanical or hydraulic, but such brakes are incapable of preventing the slippings on rainy, snowy and icy roads, thereby actually losing the braking functions.

In order to remedy such a problem, automobiles are driven in a state with various auxiliary means such as chains attached on the tires, but this was not an essential solution. As a result, various traffic accidents are caused, human lives and properties are sacrificed, and the traffic jams are aggravated when such a traffic accident occurs. Further, relative to the poor road networks, the number of automobiles is increased in the ratio of geometrical progression, and therefore, it is the actual circumstance that automobiles run in a state without securing safety distances as against the foregoing automobiles, thereby causing frequent traffic accidents. Notwithstanding, there has not been set up a satisfactory

policy which is capable of coping with such difficult circumstances.

Second, the currently running automobiles are not provided with a means which makes it possible to perform left turn or right turn in a stopped state, and therefore, those automobiles can not perform turnings by over 70 degrees. Accordingly, the automobiles can not turn the advancing direction in a parked or stopped state, and also can not perform steep turnings during the runnings. Therefore, in light of the fact that there are narrow alleys everywhere, automobile drivers have to experience severe difficulties, and if an automobile is to turn the advancing direction in a parked or stopped state, a large space is required. Besides, there are accompanied various other difficulties, thereby aggravating the traffic conditions.

Third, the currently running automobiles are not suitable for running on the narrow, unpaved and steeply sloped roads of the rural areas, and further, if a wheel of an automobiles is caught in a trench or in a quagmire, the automobile can not get rid of it by its own ability (having no such means), thereby making it imperative to

call a towing truck, or to resort to other helping means. Further, when it is necessary to lift the car body due to a flat tire and the like, a separate jack has to be used, there being no built-up maeans for lifting a part of the automobile.

SUMMARY OF THE INVENTION

The present invention is intended to overcome the above described disadvantages of the existing automobiles.

Therefore it is a first object of the present invention to provide an auxiliary track mechanism for automobile, in which an auxiliary braking mechanism is installed separately from the existing braking mechanism, so that an abrupt stopping of the automobile should be possible, and that automobiles can be run at normal speeds regardless of the road conditions, and nevertheless assuring the driving safety, thereby preventing the traffic accidents, and contributing to dissipating the traffic congestions.

It is a second object of the present invention to provide an auxiliary track mechnaism for automobile, in which an auxiliary turning means is installed, so that it should be possible to turn the automobile arbitrarily during the running, and that an automobile can be turned even in a narrow place if only a space equivalent to the diagonal line of the automobile is available, thereby providing a drastically improved movility and convenience to the driving of the automobile.

It is a third object of the present invention to provide an auxiliary track mechanism for automobile, in which an extending means is installed on the endless tracks, so that the automobile can be lifted from the ground by its own force, therby making it needless to use a separate jack during the replacing of a flat tire or other repaires, making it needless to call a towing truck or other helping means when the automobile is caught in a trench or in a quagmire, thus making the functions of an automobile more sophisticated, and further, making it possible to run an automobile through mountainous roads in an easy manner by utilizing the endless tracks.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and other advantages of the present invention will become more apparent by describing in detail the preferred embodiment of the present invention with reference to the attached drawings in which:

Figure 1 is a perpective view showing the overall external constitution of the device of the present invention;

Figure 2 is a sectional view taken along the line A-A of Figure 1;

Figure 3 is an enlarged illustration of the portion C of Figure 2, showing an operating state in which the endless track portion is being lowered by means of a hydraulic system;

Figure 4 is a sectional view taken along the line B-B of Figure 1;

Figure 5 is an enlarged illustration of the portion D of Figure 1;

Figure 6 is an enlarged illustration of the portion E of Figure 4;

Figure 7 is an enlarged illustration of the portion F of Figure 4;

Figure 8 is a partly cut-out perspective view of a gear box for transmitting the power for driving the endless track, showing the first operating position of the lever;

Figure 9 illustrates the internal structure of the gear box for transmitting the power for driving the endless track, showing the power transmitting state at the first operating position;

Figure 10 is a partly cut-out perspective view of the gear box for transmitting the power for driving the endless track, showing the second operating position of the lever;

Figure 11 is a lateral sectional view showing the internal structure of the gear box for transmitting the power for driving the endless track, and showing

the power transmitting state at the second operating position;

Figure 12 is a partly cut-out perspective view of the gear box for transmitting the power for driving the endless track, showing the third operating position of the lever;

Figure 13 is a lateral sectional view showing the internal structure of the gear box for transmitting the power for driving the endless track, showing the power transmitting state at the third operating position;

Figure 14 is a schematical view of the hydraulic system according to the present invention;

Figure 15 is an examplary view of the device of the present invention installed to an automobile;

Figure 16 illustrates an operating state in which the endless track is speedily lowered by the hydraulic system during an abrupt stopping of the automobile;

Figure 17 is a perspective view of the hydraulic lever attached to the steering handle of the automobile;

Figure 18 examplarily illustrates an operating state of the present invention, in which the wheels of the automobile and the endless track of the present invention are parallelly used; and

Figure 19 examplarily illustrates another operating state of the device of the present invention, in which the endless track is lowered to the maximum limit by the hydraulic system, with the car body lifted to a proper height.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in Figures 1 and 2, a rectangular supporting frame 2 is formed by weld-joining piped supporting beams 1 of proper lengths. Connecting beams 3, 3' are connected between proper positions of the opposite ends of a rear supporting beam 1b and proper positions of the

opposite ends of driving shafts 62, 62' (to be described below) which are inserted into a hollow space 1a' of a front supporting beam 1a. Between the lower ends of the connecting beams 3,3', there is connected an auxiliary supporting beam 4, while, at the opposite ends of the respective supporting beams 1 and at the opposite ends of the auxiliary supporting beam 4, there are installed auxiliary rollers 5. At the opposite ends of the driving shafts 62, 62' (to be described below) which are inserted into the hollow space 1a' of the front supporting beam 1a, there are fixedly installed driving sprockets 6 which are also fixed to the supporting frame 2. An endless track 7 which is made of a hardened rubber material is installed in such a manner that it should circulate around both the auxiliary rollers 5 and the driving sprockets 6 which are fixed to the supporting frame 2. On the treading surface of the endless track 7, there are formed a plurality of chevron shaped crawling projections which are for increasing the frictions as against the ground, and in which steel cores are buried. At the centre of the supporting frame 2, there are installed a rotary connecting unit 9' and an installing fixture 9, the latter being for installing the torque transmitting mechanism. The above are the overall structure of the

device of the present invention.

The detailed features of the device of the present invention are illustrated in Figures 2 to 19. As shown in these drawings, as the major components, there are included a power transmitting means, an automobile turning means, an automobile lifting means, a driving means (including a speed shifting device), an endless track extending means, and a hydraulic system for precisely controlling the above mentioned respective means. First, the power transmitting means, the automobile turning means and the lifting means, all of which are illustrated in Figures 1 to 3, will be described below in a parallel manner.

An shown in Figures 2 and 3, a spline 15 is formed on the circumference of an output shaft 14 which is projected from a transmission 12 containing a speed-shifting mechanism, and which is for transmitting the dynamic power to a driving shaft 13. On the spline 15, there is installed a bevel gear 17 on which a ratchet 16 is integrally formed, with a ratchet hook 18 being provided on the ratchet 16. A hydraulic cylinder 19 is attached under the transmission 12, with an actuating rod 20 being provided on the hydraulic cylinder 19, and the end of

the actuating rod 20 is connected to the ratchet hook 18, so that the bevel gear 17 having the actuating ratchet 16 should move to left and right on the spline 15 in accordance with the extension and contraction of the actuating rod 20. A stopper 21 is fixedly installed at a proper position of the output shaft 14, so that the displacements of the bevel gear 17 which is moved by the actuating rod 20 should be precisely limited. The installing fixture 9 includes separate upper and lower gear cases 25, 26 which respectively have rooms 23, 24, and, on the top of the lower gear case 26, there is rotatably installed a disc shaped supporting plate 28 on which the rotary connecting unit 9' and a securing piece 27 are fixed together. Meanwhile, under the upper gear case 25, there are fixedly installed a plurality of hydraulic cylinders 30 having actuating rods 29 respectively. A fixed plate 31 is installed between the supporting plate 28 and the securing piece 27, in such a manner that slidings between the fixed plate 31 and the latter two components should be smooth. The lower ends of the actuating rods 29 of the hydraulic cylinders 30 are secured to the fixed plate 31 by means of bolts, while, on sides of the hydraulic cylinders 30, there are installed limit switches 32, 32', 32" for detecting upper, intermediate

and lower positions, in a state with the switches being installed on a position detecting device 33. An actuating rod 34 on which an actuating head 34' is attached is inserted into the position detcting device 33, and the lower end of the actuating rod 34 is fixedly secured to the fixed plate 31, so that the descending distance of the actuating rod 29, which is inserted into the hydraulic cylinder 30 and fixedly installed to the fixed plate 31, should be precisely controlled.

Meanwhile, within the room 23 of the upper gear case 25, there is installed a worm gear 36, and from the worm gear 36, there is extended a supporting tube 35 of a proper diameter, within which a spline 35' is formed. Further, the supporting tube 35 is installed in such a manner that it should pass through the lower end of the upper gear case 25. The lower end of the supporting tube 35 is fixedly secured to the supporting plate 28 which is fixedly attached to the lower gear case 28, while, between the contacting surfaces of the supporting tube 35 of the worm gear 36 and the upper gear case 25, there are disposed bearings 37 and washers 38, so that the worm gear 36 should smoothly rotate. Here, the contacting portions of the supporting tube 35 and the fixed plate 31 are separated

from each other, so that the revolving power of the worm gear 36 should not be transmitted to the fixed plate 31.

At a side of the upper gear case 25, there is installed a dc motor 39 in such a manner that it can be laterally moved. The revolution shaft of the dc motor 39 takes the form of a worm 40 which is meshed with the worm gear 36 of the upper gear case 25, so that the worm gear 36 should revolve in a fixed direction upon receipt of the revolving power from the dc motor 39. From the centre of the lower gear case 26 which is fixed to the supporting frame 2, there is extended a proper length of connecting tube 42, within which a bore 41 having stopper step 41' at its lower end is formed, and on the outside of which a connecting spline 42' is formed. the connecting tube 42 is inserted into the bore of the supporting tube 35 of the worm gear 36, in such a manner that the connecting spline 42' of the connecting tube 42 should be matched with the connecting spline 35' of the supporting tube 35. This brings the result that the revolving power of the worm gear 36 which owes to the dc motor 39 is transmitted to the lower gear case 26.

The bore 41 which is formed through the connecting tube

42 and open to the lower gear case 26 includes a bearing retaining space 43 and stopper steps 43', 43" at its lower end, and receives a revolution shaft 45 of a proper length, a connecting spline being formed on the inner circumferential wall of the revolution shaft 45. At the lower end of the revolution shaft 45 which is disposed within the room 24 of the lower gear case 26, there is fixedly secured a bevel gear 48 by means of a fastening washer 46 and a bolt 47, while the stopper step 43' which is projected from the lower portion of the revolution shaft 45 is let to contact with the stopper step 41' which is projected within the hollow space 41 of the connecting tube 42. In such a state, a bearing 49 is inserted into the bearing retaining space 43 which is formed between the lower gear case 26 and the revolution shaft 45, the bearing 49 being firmly installed by means of a securing washer 50.

A connecting shaft 51 of a proper length is installed in such a manner that it should pass through the centre of the upper gear case 25 and the centre of the worm gear 36, and that it should be connected concentrically to the bore of the revolution shaft 45. Further, the connecting shaft 51 is provided with a connecting spline

52 of a proper length at its lower portion, and the connecting spline 52 is meshed with the connecting spline 44 of the revolution shaft 45. Bearings 53, 54 are installed between the connecting shaft 51 and the upper gear case 25, and between the connecting shaft 51 and the worm gear 36, while, at the upper end portion of the connecting shaft 51, there is fixedly installed a power transmitting bevel gear 55.

Therefore, the bevel gear 17 which is fitted to the outer spline 15 of the output shaft 14 can be meshed with the bevel gear 55 of the connecting shaft 51, after being moved by the actuating ratchet 16, so that the revolving power of the output shaft 14 should be transmitted to the bevel gear 48 which is fixedly installed on the revolution shaft 45.

As shown in Figure 14, there is provided an endless track operating system which includes: a pressure sensor 132 for sensing the hydraulic pressure generated upon abrupt pressing of the brake pedal 131 in order to stop the automobile abruptly; and a magnetic electronic valve 133 operated in accordance with the output of the pressure sensor 132. There is provided another operating system

which includes: a button switch 134 for lowering and lifting the endless track 7 arbitrarily by the driver in order to turn or run the automobile by means of the endless track 7 in a situation requiring other than an abrupt stopping of the automobile; and a magnetic electronic valve 135 operated by means of the button switch 134.

These two systems are operationally connected to the hydraulic cylinder 30 for lowering/lifting the endless track 7, with the result that a power transmitting mechnaism, an automibile turning mechanism and a lowering/lifting mechanism are rendered to be operable.

Thus, the power transmitting mechanism, the automobile turning mechanism and the lowering/lifting mechnaism are parallelly formed, and their opeartions will be described below.

If the hydraulic cylinder 19 which is attached to the transmission 12 is activated by pressing an operating button (not shown) which is installed at a proper place of the driving seat, then the actuating rod 20 of the hydraulic cylinder 19 is moved in one direction. Then the bevel gear 17 which is fixed to the operating

ratchet 16 having a ratchet hook 18 at the end of the actuating rod 20 is moved rightwardly a certain distance along the spline 15 of the output shaft 14, and the bevel gear 17 is meshed with the bevel gear 55 of the connecting shaft 51, so that the revolving power of the output shaft 14 should be transmitted to the connecting shaft 51. Under this condition, the displacement of the bevel gear 17 is precisely controlled by the stopper 21 which is installed on the spline 15 of the output shaft 14, so that the mesh state between the bevel gear 17 and the bevel gear 55 should be properly adjusted.

Under such a condition, if the revolving power of the output shaft 14 is transmitted to the connecting shaft 51, then the revolution shaft 45 which is connected through the connecting splines 44, 52 to the connecting shaft 51 is revolved in a state inserted into the hollow space 41 of the connecting shaft 42 which is fixed to the centre of the lower gear case 26, with the result that the revolving power of the output shaft 14 is transmitted to the revolution shaft 45.

The operations of the automobile turning mechanism will now be described. That is, the automobile turning

mechanism which is an important component of the device of the present invention is for arbitrarily changing the advancing direction of the automobile during its running. If the power source of the dc motor 39 which is installed on the upper gear case 25 of the installing fixture 9 is turned on, then the revolution shaft of the dc motor 39, which takes the form of a worm 40, revolves in a certain direction, and at the same time, the worm gear 36 which is installed within the room 23 of the upper gear case 25 is let to revolve in a certain direction.

If the worm gear 36 is let to be revolved by the dc motor 39, then rotations occur; in the supporting plate 28 on which the lower tip of the supporting tube 35 is attached; in the lower gear case 26 which is fixedly attached to the supporting plate 28; and in the securing piece 27 and the rotary connecting unit 9' which are fixedly attached to the supporting plate 28. Here, the rotation occurs separately from the revolution shaft 45 and the connecting shaft 51 which are installed within the supporting tube 35 of the worm gear 36, and such separate rotations occur smoothly owing to the bearings 49, 53, 54 which are disposed at the contacting portions. Meanwhile, the fixed plate 31, on which the lower end of the actuating

bar 29 of the hydraulic cylinder 30 and the lower end of the actuating rod 34 of the position detecting device 33 are fixedly attached, maintains a fixed state between the supporting tube 35 of the worm gear 36 and the supporting plate 28 and the securing piece 27.

Therefore, the fixed plate 31, the plurality of hydraulic cylinders 30, and the upper gear case 25 which is fixedly installed on the lower frame of the automobile always maintain the fixed state regardless of the revolutions of the worm gear 36, while the supporting plate 28 and the lower gear case 26 revolve in a certain direction in accordance with the operation of the dc motor 39. Here, under a state in which the endless track is not contacted to the ground, the revolution is carried out in such a manner that the frame 2 should be rotated in a certain direction. Meanwhile, under a state in which the endless tracks 7 are contacted to the ground, and in which the automobile is lifted up by a certain height, the car body is turned in a certain direction. Here, the rotational angle of the car body is controlled by providing a separate rotational angle displaying device which is operated either electronically or manually.

Such an automobile turning mechanism can be conveniently used when turning the advancing direction of the automobile in the midst of a traffic congestion. Further, it can be also used in a narrow alley or an a sharply curved course, and makes it possible to turn the automobile in any difficult situation.

Now the operation of the lowering/lifting mechanism will be described. The upper gear case 25 which forms the installing fixture 9 is firmly installed at a proper position of the lower frame of the automobile, and the lower gear case 26 is fixedly installed on the supporting frame 2. In this state, the endless tracks 7 which are installed to the opposite sides of the supporting frame 2 are properly lowered or lifted by the lowering/lifting mechanism in accordance with the encountered situation.

When an emmergency situation is suddenly encountered, if the brake is pressed abruptly and strongly in order to stop the car, the hydraulic pressure of the hydraulic disc brake of the automobile acts with an enormously strong force compared with the case of the slow pressing of the brake pedal. Under this condition, the pressure sensor 132 which is installed at a proper position of the hydraulic

passage detects the suddenly increasing hydraulic pressure, and at the same time, the magnetic electronic valve 133 is energized to activate the lowering/lifting hydraulic cylinder 30.

Thus if the hydraulic cylinder 30 is activated, the actuating bar 29 of the hydraulic cylinder 30 speedily descends, and at the same time, the fixed plate 31 on which the actuating bar 29 is fixedly attached pushes down the supporting plate 28 and the lower gear case 26. Here, the supporting plate 28 and the lower gear case 26 smoothly descends, because the connecting spline 42' of the connecting tube 42 which is extended upwardly from the lower gear case 26 is meshed with the connecting spline 35' of the supporting tube 35 which is extended from the worm gear 36, and because the connecting tube 42 of the lower gear case 26 is inserted into the supporting tube 35 of the worm gear 36. At the same time, the supporting frame 2 which is fixedly attached with the lower gear case 26 speedily descends, and also, the endless tracks 7 which are installed at the opposite sides of the supporting frame 2 speedily descend, with the result that a large frictional force is generated between the ground and a plurality of the crawling

projections 8, thereby making it possible to stop the automobile quickly.

The frictional force generated here is immensely larger compared with the frictional force generated by the wheels of the automobile, and the numerous steel cores buried in the crawling projections 8 increase the frictional force, so that the braking distance should be further shortened. After the termination of the emergency situation, the driver can release the pressing of the brake pedal so as for the brake pedal to be restored to the original position. Thereupon, if the hydraulic pressure is lowered to below a certain level, the pressure sensor 132 detects the lowering of the pressure, and at the same time, the magnetic electronic valve 133 is activated, with the result that the actuating bar 29 of the hydraulic cylinder 30 is restored to the original position, and that the supporting frame 2 is also restored to the original position, thereby making it possible to continue in running the automobile.

Meanwhile, in the case where the automobile is wanted to be turned with a large angle, or where the automobile is wanted to be run by means of the endless tracks 7, if the

button switch 104 which is installed on the driving seat is pressed, the magnetic electronic valave 105 which is electrically connected to the button switch 104 is activated, with the result that the hydraulic cylinder 30 is activated. Thereafter, the process of lowering/lifting the endless tracks 7 in accordance with the pressure sensor 132 is carried out in the manner described above. Here, the lowering distance of the actuating bar 29 of the hydraulic cylinder 30 is properly controlled by both the operating head 34' of the upper end of the actuating rod 34 and by the limit switches 32, 32', 32", because the actuating rod 34 of the position detecting device 33 which is installed on a side of the hydraulic cylinder 30 is actuated in accordance with the lowering/lifting of the actuating bar 29, in a state with the actuating rod 34 fixedly attached to the fixed plate 31. This lowering/lifting mechanism is properly operated depending on the encountered situations such as an abrupt stopping of the automobile, a steep turning, a running by means of the endless tracks, and the like.

The above described power transmitting mechanism is used in transmitting the revolving power of the output shaft 14 through the bevel gear 48 of the room 24 of the lower gear

case 26 to the driving sprockets 6 which are installed at the opposite ends of the supporting beam 1a, thereby driving the endless tracks 7. The driving mechanism includes the above mechanism in addition to a speed shifting means for shifting the speed to a number of stages. This driving mechanism and the extending mechanism will be described below regarding their constitutions referring to Figures 2, 4 and 13.

At the centre of the supporting beam 1a which forms a part of the supporting frame 2, there is installed a gear case 57 having a room 56 of a proper size. That is, at the front edge of the supporting frame 2 on which the lower gear case 26 forming the installing fixture 9 is fixedly attached, the gear case 57 is installed in such a manner that the hollow space 1c' of the supporting beam 1c and the room 56, and the hollow space 1a' of the front supporting beam 1a and the room 56 should communicate each other. Meanwhile, in the hollow space 1c' of the middle supporting beam 1c, there is installed a connecting driving shaft 59 in such a manner that it should be smoothly revolved in a state supported by bearings 58, 58'. Also the connecting driving shaft 59 is installed in such a manner that its opposite ends should

be disposed within the room 24 of the lower gear case 26 and within the gear case 57 of the supporting beam 1a. Further, the connecting driving shaft 59 is fixedly provided with bevel gears 60, 61 at its opposite ends, in such a manner that the bevel gear 60 should maintain meshing with the bevel gear 48 of the revolution shaft 45 all the time. Accordingly, the revolving power which passes through the bevel gear 48 reaches the bevel gear 61 which is disposed within the room 56 of the gear case 57.

Driving shafts 62, 62', which are inserted into the hollow space 1a' of the front supporting beam 1a in a state with ends of them fixedly attached to the driving sprocket 6, are provided with connecting splines 63, 63' on one end portions of them. Further, the driving shafts 62, 62' are let to revolve in a state supported by bearings 64, 64' which are inserted into the bore of the supporting beam 1a, while the splines 63, 63' of the driving shafts 62, 62' are connected to power transmission adjusting members 65, 65' of a proper shape, in such a manner that the members 65, 65' should face each other from the opposite sides of the room 56 of the gear case 57. Further, between the outer circumferences of the power transmission

adjusting members 65, 65' and the inner cicumferences of the gear case 57, there are installed bearings 66, 66', so that the power transmission adjusting members 65, 65' should be rotatably secured.

At the other ends of the driving shafts 62, 62', there are installed friction faces 67, 67', connecting splines 68, 68' and shaft retaining sections 69, 69' properly in the cited order. On the friction faces 67, 67', there are installed a plurality of pressing rods 71, on the opposite ends of which fixed pieces 70, 70' are fixedly installed, while on the outwardly extended pressing rods 71, there are installed compression springs 72 having a proper leasticity in a state supported by the securing pieces 70. Disc shaped pressing plates 73, 73' are respectively secured by means of securing pieces 70', and between the pressing plate 73 or 73' and friction face 67 or 67', there is installed a disc 75 or 75' having a connecting spline 74 or 74' on the bore thereof, so that the disc 75 or 75' should be press-contacted on the friction face 67 or 67' all the time by the compression springs 72 and the pressing plate 73 or 73'.

As shown in Figures 4 and 6, a power transmitting shaft

79 is constituted such that: a bevel gear 76 is integrally formed; supporting ends 77, 77' are formed at the opposite ends thereof; and connecting splines 78, 78' are provided separated by a certain distance from the supporting ends 77, 77'. The power transmitting shaft 79 extends within the room 56 of the gear case 57 to the power transmission adjusting member 65 or 65' which is connected to the driving shaft 62 or 62', while the opposite ends of the power transmitting shaft 79, i.e., the supporting ends 77, 77' are fitted into shaft retaining portions 69, 69' of the power transmission adjusting members 65, 65'.
Further, bearings 80 are disposed between the supporting tips 77, 77' and the shaft retaining portions 69, 69', so that the power transmitting shaft 79 should be smoothly revolved. Here, the bevel gear 76 which is integrally formed with the power transmitting shaft 79 is kept in mesh with the bevel gear 61 of the connecting driving shaft 59 which is disposed within the room 56 of the gear case 57, so that the revolving power passing through the connecting driving shaft 59 should be transmitted to the power transmitting shaft 79.

A bevel gear 84 having an extended connecting portion 83 is fixed to the other end of the power transmitting shaft

79, and the connecting portion 83 which is extended from the bevel gear 84 is constituted such that: an inner connecting spline 81 is formed on its bore so as for it to be coupled with or detached from the connecting spline 78' of the power transmitting shaft 79; and a connecting spline 82 is formed on the rear outer circumference of it. The bevel gear 84 is provided with a ratchet hook 85 at its leading end, and an actuating ratchet 88 is constituted such that: it is provided with an inner connecting spline 86 on its bore so as for the actuating ratchet 88 to be meshed with the connecting spline 82 of the integral connecting portion 83 of the bevel gear 84; and a connecting spline 87 is formed on its outer circumferential surface so as for the actuating ratchet 88 to be meshed with or detached from the connecting spline 74' of the disc 75' and the connecting spline 68' of the power transmission adjusting member 65'.

The actuating ratchet 88 constituted as described above is coupled with the connecting portion 83 of the bevel gear 84, in such a manner that the actuating ratchet 88 should be laterally movable. Further, the actuating ratchet 88 is provided with a ratchet hook 89 on its outer circumferential surface thereof, and another actuating

ratchet 92 is constituted such that: it is provided with an outer connecting spline 91 so as for the actuating ratchet 92 to be meshed with or detached from the connecting spline 74 of the disc 75 and the connecting spline 68 of the power transmission adjusting member 65; and the actuating ratchet 92 is also provided with an inner spline 90 on its bore so as for the actuating ratchet 92 to be meshed with the connecting spline 78 of the power transmitting shaft 79. The actuating ratchet 92 constituted as described above is coupled with the power transmitting shaft 79, in such a manner that it should be laterally movable.

Further, the actuating ratchet 92 is provided with a ratchet hook 93 on its outer circumferential surface in a fixed manner. Actuating bars 94a, 94b, 94c respectively extend from the ratchet hooks 85, 89, 93 of the actuating ratchets 88, 92 and the bevel gear 84, and rotating bars 95a, 95b, 95c are installed in such a manner as to pass through and supported by the opposite side walls of the gear case 57. The ends of the actuating bars 94a, 94b, 94c are fixedly connected to the rotating bars 95a, 95b, 95c respectively, and ceratin lengths of the rotating bars 95a, 95b, 95c are exposed to the outside of the gear

case 57, with pivoting pieces 96a, 96b, 96c being fixed to the exposed portions.

Actuating rods 97a', 97b', 97c' of hydraulic actuating cylinders 97a, 97b, 97c are fixed to the tips of the pivoting pieces 96a, 96b, 96c respectively, so that the pivoting bars should be pivoted in accordance with the extension of the actuating rods. Accordingly, the respective actuating bars 94a, 94b, 94c can be pivoted, and at the same time, the actuating ratchets 88, 92 and the bevel gear 84 on which the ratchet hooks 85, 89, 93 are respectively secured are moved to the left or right by a certain distance.

As shown in Figures 8, 10 and 12, a speed shifting lever box 102 is constituted such that: it includes adjusting pieces 99, 99' having actuating rods 98, 98' respectively; a guide slot 100 is formed on the upper face thereof; and a speed shifting lever 101 having an adjusting bar 101' at its lower end is installed through the guide slot 100 and adjacently to the adjusting pieces 99, 99'. The above described specd shifting lever box 102, actuating valves 103, 103' operated by the box 102, and a rotation connecting device 9' constitute a part of a hydraulic system.

This hydraulic system is connected to the hydraulic actuating cylinders 97a, 97b, 97c, so that the respective actuating cylinders 97a, 97b, 97c should be selectively actuated by the actuating valves 103, 103' which are operated in accordance with the position of the speed shifting lever 101 within the guid slot 100. Accordingly, the actuating ratchets 88, 92 and the bevel gear 84 move to certain positions, with the result that the revolving power of the output shaft 14 is transmitted to the driving sprocket 6, after properly shifting its speed.

As shown in Figure 7, oil passage terminals 105 are formed through the opposite ends of the front supporting beam 1a of the supporting frame 2, and at the ends of the oil passage terminals 105, there are installed brake adjusting members 110 by means of bolts 111, in each of which there is inserted a pressing unit 109 which in turn includes a movable piece 106, a stopper step 107 and a pressing piece 108 in a fixedly combined form. A steering brake plate 112 is respectively disposed between the pressing units 109, and the steering brake plates 112 are firmly secured to the driving shafts 62, 62' respectively in order to fixedly combine them. As shown in Figure 17, at the lower end of a handle shaft 116, there is fixedly

installed an installing plate 115, with the opposite ends of the steering brake adjusting rod 113 being connected between hydraulic cylinders 114, 114'. A pinion 117 is fixedly installed at an end of the handle shaft 116, and a rack 118 is formed at the centre of the steering brake adjusting rod 113 in order to make the rack 118 meshed with the pinion 117. Thus, if the pinion 117 is rotated by rotating the handle shaft 116, the steering brake adjusting rod 113 is moved to the left or right by the pinion 117.

The respective hydraulic cylinders 114, 114' and the steering brake adjusting rods 110 which are fixedly installed at the opposite ends of the front supporting beam 1a are interconnected by means of hydraulic tubes 119, in such a manner that the hydraulic fluid of the hydraulic cylinders 114, 114' should selectively flow into the oil passage terminal 105 of the steering brake adjusting rod 110 in accordance with the leftward or rightward displacement of the steering brake adjusting rod 110. At the same time, the respective pressing units 109 are moved, with the result that the pressing units 109 are moved by the pressure of the hydraulic fluid which is selectively introduced in accordance with the

rotational direction of the handle shaft 116. Consequently, the steering brake plates 112 which are fixedly installed to the respective driving shafts 62, 62' are pressed, so that the number of the turns of one of the driving shafts 62, 62' should be properly reduced, thereby froming a drving mechanism including a speed shifting means.

As shown in Figures 2 and 14, the endless track extending mechanism is constituted such that: the ends of a hydraulic cylinder 120 are installed to the opposite ends of the rear supporting beam 1b in such a manner as to be movable to a certain degree; the end of an actuating rod 120' of the hydraulic cylinder 120 is installed at a proper position of the middle portion of the auxiliary supportion beam 4 which is pivotally connected between the connecting shafts 3, 3'; an actuating valve 121 formed as an actuating means for the hydraulic cylinder 120 is connected to the hydraulic cylinder 120; and an operating means for the actuating valve 121 is installed at a proper position on the driving seat.

In the drawings, reference code 10 indicates a shock absorber for absorbing impacts, 11 indicates a secession preventing protuberance, 11' indicates a driving sprocket

engaging slot, 122 and 123 indicate oil tanks, 124 indicates an oil pump, 125 indicates an existing clutch installed on the automobile, 126 and 126' indicate ordinary disc brakes installed on the driving sprocket 6, and 136 indicates an existing master cylinder.

The driving mechanism and the endless track extending mechanism of the present invetnion constituted as above will now be described as to their operations in the cited order.

The bevel gear 48 of the revolution shaft 45 and the bevel gear 60 of the connecting driving shaft 59 are always maintained in a meshed state, and therefore, the revolving power of the output shaft 14 can reach the bevel gear 61 which is disposed within the room 56 of the gear case 57. Further, the bevel gear 61 of the connecting driving shaft 59 always maintained in a meshed state with the bevel gear 76 which is integrally formed with the power transmitting shaft 79, with the result that the power transmitting shaft 79 can receive the revolving power of the output shaft 14 continuously.

Such a power transmission can be carried out by transferring

the revolving power of the output shaft 14 to the connecting shaft 51 after lowering the endless tracks 7 by means of the lowering/lifting mechanism. The revolving power of the output shaft 14 which has reached the power transmitting shaft 79 is transmitted through the power transmission adjusting members 65, 65' to the respective driving shafts 62, 62' in order rotate the driving sprocket 6, thereby making it possible to run the automobile by means of the endless tracks 7. In this process, the revolving power of the output shaft 14 is properly adjusted by means of the speed shifting means, and is transmitted to the driving shafts 62, 62'. This will be described in detail for the respective stages(first, second and third stages).

First, the operating process at the second stage will be described referring to Figures 10 and 11. If the speed shifting lever 101 which is accommodated within the guide slot 100 of the speed shifting lever box 102 is set to the second stage of the guide slot 100 in an upright posture, the normal running to the forward or reverse direction can be performed. Under this condition, the bevel gear 84 and the power transmitting shaft 79 are connected each other through the respective connecting splines

78', 81, and the connecting spline 87 of the actuating ratchet 88 which is coupled with the connecting portion 83 of the bevel gear 84 is meshed only with the connecting spline 74' of the disc 75'. Further, the outer spline 91 of the actuating ratchet 92, which is meshed with the connecting spline 78 of the power transmitting shaft 79, is also meshed only with the connecting spline 74 of the disc 75, and in this state, the actuating ratchet 92 revolves between the power transmitting members 65, 65'.

In this process, the outer connecting splines 87, 91 of the actuating ratchets 88, 92 and the discs 75, 75' meshed with the connecting splines 74, 74' are respectively disposed between the pressing plates 73, 73' and the friction faces 67, 67' of the power transmission adjusting member 65, 65'. In this state, the pressing plates 73, 73' push the discs 75, 75' toward the friction faces 67, 67' through the help of the compression springs 72 which exert forces to the pressing rods 71, and therefore, the revolving power of the power transmitting shaft 79 is transmitted to the power transmission adjusting members 65, 65'. The revolving power passing through the power transmission adjusting members 65, 65' is transmitted through the connecting splines 63, 63' to the driving shafts 62, 62',

so that the driving sprocket 6 should be rotated, thereby making it possible to forwardly run the automobile using the endless tracks 7. Meanwhile, in the case of a reverse running, the output shaft 14 has only to be reversely rotated by means of the existing speed shifting device of the automobile, and, under this condition, regardless of whether the automobile is run forwardly or reversely by means of the endless tracks, the revolution speed of the output shaft 14 is transmitted without reduction.

When the automobile is driven forwardly or reversely using the endless tracks 7, if a right turn or a left turn of the automobile is wanted, the turning can be carried out based on the method described below. This process will be described referring to Figures 8 and 9. That is, the operating process of the first stage for properly adjusting the speed ratio of the two endless tracks 7 will be described. First, the speed shifting lever 101 which is accommodated within the guide slot 100 of the speed shifting lever box 102 is laterally moved to position it at the first stage of the guide slot 100. Then, owing to the adjusting bar 101' of the speed shifting lever 101 which is inserted between the two adjusting pieces 99,99'

in an overlapped state, both of the adjusting pieces 99, 99' are moved to one side, and at the same time, the actuating rods 98, 98' which are fixedly attached to the adjusting pieces 99, 99' are also moved. Accordingly, proper amounts of hydraulic fluid are introduced into the actuating cylinders 97a, 97b, 97c which are connected through the rotary connecting unit 9', with the result that the respective actuating rods 97a', 97b', 97c' are properly extended. As a result, the pivoting pieces 96a, 96b, 96c which are respectively disposed between the actuating rods 97a', 97b', 97c' and the rotating bars 95a, 95b, 95c are pivoted respectively around the rotating bars 95a, 95b, 95c, so that thr rotating bars 95a, 95b, 95c should be rotated in a certain direction. At the same time, the actuating bars 94a, 94b, 94c which are respectively installed between the rotating bars 95a, 95b, 95c and the ratchet hooks 85, 89, 93 are respectively pivoted in a certain direction, and consequently, the actuating ratchets 88, 92 and the bevel gear 84, on which the ratchet hooks 85, 89, 93 are respectively attached are respectively moved.

Therefore, the bevel gear 84 is meshed with the bevel gear 61 of the revolution shaft 59, and the actuating ratchet 88

is moved from the connecting portion 83 of the bevel gear 84 to the power transmission adjusting member 65', with the result that the outer connecting spline 87 is meshed with both the connecting spline 74' of the disc 75' and the connecting spline 68' of the power transmission adjusting member 65'. Meanwhile, the actuatin ratchet 92 which has been meshed with the connecting spline 78 of the power transmitting shaft 79 is moved toward the power transmission adjusting member 65, with the result that the outer connecting spline 91 is meshed with both the connecting spline 74 of the disc 75 and the connecting spline 68 of the power transmission adjusting member 65.

In this state, if the bevel gear 76 and the bevel gear 84 are simultaneously meshed with the bevel gear 61 of the connecting driving shaft 59, then the revolving power of the output shaft 14 is transmitted to the power transmitting shaft 79. Here, the two revolving powers, i.e., the revolving power which is transmitted through the bevel gear 76 of the power transmitting shaft 79, the connecting spline 78, the actuating ratchet 92 and the power transmission adjusting member 65 in the cited order ultimately to the driving shaft 62 on the one hand,

and the revolving power which is transmitted through the bevel gear 84, the actuating ratchet 88 and the power transmission adjusting member 65' in the cited order ultimately to the driving shaft 62' on the other hand, are acted in the opposite directions from each other, thereby making it possible to perform a left turn or a right turn by means of the endless tracks 7.

Under this condition, if the handle is properly rotated for a left turn or a right turn, the pinion 117 which is installed at the lower end of the handle shaft 116 is rotated, and at the same time, the rack 118 which is disposed at the centre moves to one side the steering brake adjusting rod 113 which is meshed with the pinion 117. Consequently, the steering brake adjusting rod 113 which has its opposite end portions inserted into the hydraulic cylinders 114, 114' of the opposite sides is biased into one of the two cylinders 114, 114', with the result that the hydraulic fluid flows selectively into one of the steering brake adjusting members 110 which are disposed at the opposite ends of the supporting beam 1b, and which are interconnected by means of a hydraulic tube 119.

Under this condition, the pressing unit 109 which is inserted into an end of the oil passage terminal 105 is moved by the pressure of the hydraulic fluid, and therefore, the steering brake plates 112, which are fixedly attached to the driving shafts 62, 62' respectively, are pressed. As a result, of the driving shafts 62, 62' which revolve in the opposite directions each other, the driving shaft which revolves in the reverse direction is subjected to a reduction of the revolution speed, thereby reinforcing the turning capability of the endless tracks 7.

The third stage is used in order to transmit large forces to the driving shafts 62, 62' under adverse conditions such as steepness of the road or muddiness of the road when running the automobile using the endless tracks 7, and this third stage will be described referring to Figures 12 and 13. First, the speed shifting lever 101 which is accommodated within the guide slot 100 of the speed shifting lever box 102 is moved to be set to the third stage. Then the adjusting bar 101' of the speed shifting lever 101 is moved in a state inserted only into the adjusting piece 99 of the two adjusting pieces 99, 99', and consequently, the adjusting piece 99 and the

actuating rod 98 are also moved. Accordingly, of the actuating cylinders 97a, 97b, 97c which are connected through the rotary connecting unit, proper amounts of the hydraulic fluid are introduced only into the actuating cylinders 97b, 97c, so that the actuating rods 97b', 97c' should be properly extended, and that the actuating ratchets 88, 92 should be moved in the same manner as described under the first stage.

Under this condition, the revolving power of the output shaft 14 is transmitted to the power transmitting shaft 79 through the bevel gear 76 which is meshed with the bevel gear 61 of the connecting driving shaft 59. Then the revolving power of the power transmitting shaft 79 is directly transmitted to the power transmission adjusting members 65, 65' of the opposite sides, with the result that the driving shafts 62, 62' are let to revolve. Owing to the driving shafts 62, 62', the automobile becomes capable of easily running using the endless tracks 7 under any adverse conditions of the rod. When running the automobile using the endless tracks 7 under the second stage, if the brake pedal is pressed in order to stop the automobile abruptly, then the ordinary disc brakes 126, 126' which are installed to the driving

sprockets 6 of the opposite sides of the drivding shafts 62, 62' are activated to stop the revolutions of the driving shafts 62, 62'. At the same time, oppositely directed revolving forces are applied to the discs 75, 75' which have been transmitting the revolving powers in a state press-contacted with the friction faces 67, 67' of the power transmission adjusting members 65, 65'. As a result, between the friction faces 67, 67' and the discs 75, 75', there occur slips, so that the revolving power transmitted from the power transmitting shaft 79 should be blocked, thereby making the endless tracks 7 stopped abruptly.

The endless track extending mechanism which is installed between the rear supporting beam 1b and the auxiliary supporting beam 4 is activated in order to fold up the endless tracks 7 during a running or during a turning using the endless trcaks 7. That is, the hydraulic system which includes the hydraulic cylinder 120 and the operating valve 121 is activated by means of an actuating means provided on the driving seat in order to lower of lift the endless tracks 7 depending on the situation, thereby providing conveniences to the driving of the automobile.

According to the present invention which can be adopted on various automobiles such as passenger cars and trucks, various traffic accidents can be prevented, and an automobile can be turned in a narrow place in an arbitrary manner, thereby improving the mobility of automobile. Further, the maintenance and repair of autombiles are rendered convenient, because the car body can be arbitrarily lifted up. Further, an automobile can be driven through mountainous steep roads and narrow roads in an easy way, and therefore, the running capability of automobile is maximized.

What is claimed is:

1. A multi-purpose auxiliary track mechanism for automobile, comprising: a rectangular supporting frame 2 consisting of piped supporting beams 1 weld-fixed each other; driving shafts 62, 62' extended through a hollow space 1a' of a front supporting beam 1a; a rear supporting frame 1b; auxiliary supporting beams 4 pivotally connected to the lower tips of connecting beams 3, 3' by means of bearings 3a, 3b, said connecting beams 3,3' being connected to the opposite ends of said driving shafts 62, 62' and to the opposite ends of said rear supporting beam 1b; auxiliary rollers 5 installed at the opposite ends of said auxiliary supporting beams 4 and to the opposite ends of said front and rear supporting beams 1a, 1b; driving sprockets 6 installed at the opposite ends of said driving shafts 62, 62', all the above mentioned components forming a supporting frame 2;

a pair of circular endless tracks 7 made of hard rubber installed around and connecting said driving sprockets 6 and said auxiliary rollers 5 of said supporting frame 2;

a plurality of crawling projections 8 attached on said endless tracks 7 and with a plurality of steel cores buried in said crawling projections 8;

a rotary connecting unit 9' and an installing fixture 9 installed at the centre of said supporting frame 2; and

actuating compomnents including; a power transmitting mechanism; an automobile turning mechanism; a lowering/lifting mechanism; a driving mechanism having a speed shifting means; an endless track extending mechanism, with the ends of its hydraulic cylinders 120 being connected to the opposite ends of said rear supporting beams 1b of said supporting frame 2, with the ends of its actuating rod 120' being connected to said auxiliary supporting beams 4, and with an actuating valve 121 being installed in order to operate said hydraulic cylinder 120 so as for said supporting frame 2 to be foldable; and a hydraulic control system.

2. The multi-purpose auxiliary track mechanism for for automobile as claimed in claim 1, wherein said

power transmitting mechanism, said automobile turning mechanism, and said lowering/lifting mechanism, all of which are formed in a parallel and combined form, are constituted such that: an outside spline 15 is formed on an output shaft 14; a bevel gear 17 with an actuating ratchet 16 formed in an integral form is installed on said spline 15; a ratchet hook 18 is formed on said actuating ratchet 16; a hydraulic cylinder 19 having an actuating rod 20 is attached under a transmission 12; the end of said actuating rod 20 is connected to said ratchet hook 18; a stopper 21 is fixedly installed on said output shaft 14; an installing fixture 9 consists of separate upper and lower gear cases 25, 26 having respectively rooms 23, 24; a supporting plate 28 with a rotary connecting unit 9' and a securing piece 27 fixedly combined together is fixedly installed on the top of said lower gear case 26; a plurality of hydraulic cylinders 30 respectively having actuating rods 29 are fixedly installed on the bottom of said upper gear case 25; a fixed plate 31 is inserted and supported between said supporting plate 28 and said securing piece 27; the lower ends of said actuating rods 29 of said hydraulic cylinders 30 are

fixedly secured onto said fixed plate 31; position sensors 33 having position sensing limit switches 32, 32', 32" are respectively disposed at the upper end, an intermediate position and the lower end of said hydraulic cylinder 30; an actuation rod 34 having an actuating head 34' is inserted into each of the bores of said position sensors 33; the lower end of said actuating rod 34 is fixedly attached to said fixed plate 31; a worm gear 36 having a supporting tube 35 and an inside connecting spline 35' is installed within said room 23 of said upper gear case 25; said supporting tube 35 is let to pass through the bottom of said upper gear case 25, with its lower end fixedly attached to said supporting plate 28; a bearing 37 is disposed in the contact portion between said supporting tube 35 of said worm gear 36 and said upper gear case 25; a dc motor 39 is installed on a side of said upper gear case 25; a worm 40 is formed on the revolution shaft of said dc motor 39 to mest it with said worm gear 36 of said upper gear case 35; a centre bore 41 is formed through a connecting tube 42 passing through the centre of the bottom of said lower case 26, a stopper step 41' being formed at the lower portion

of said connecting tube 42, and said connecting tube 42 being extended in a proper length to be inserted into the bore of said supporting tube 35 of said worm gear 36; said supporting tube 35 and said connecting tube 42 are coupled together so as for an inside connecting spline 35' of said supporting tube 35 and an outside connecting spline 42' of said connecting tube 42 to be meshed together; said bore 41 receives a revolution shaft 45 having stopper steps 43' 43" at its outer lower end portion, and having a connecting spline 44 on its inside; a bevel gear 48 is fixedly installed at the lower end of said revolution shaft 45; said upper stopper step 43' of the outer lower end portion of said revolution shaft 45 is let to contact with said stopper step 41' of said bore 41 of said connecting tube 42; a bearing 49 is disposed between said lower gear case 26 and a bearing retaining portion 43 of said revolution shaft 45; a connecting shaft 51 is installed in such a manner as to pass through the centre of said upper gear case 25 and the centre of said worm gear 36, and as to be inserted into the bore of said revolution shaft 45; a connecting spline 52 is formed on the lower portion of said

connecting shaft 51 in order to mesh it with said inside connecting spline 44 of said revolution shaft 45; bearings 53, 54 are installed in the contact portions between said connecting shaft 51 and said upper gear case 25, and between said connecting shaft 51 and said worm gear 36; a bevel gear 55 is fixedly installed at the upper end of said connecting shaft 51; there is provided a brake actuating system consisting of a pressure sensor 132 for detecting the brake hydraulic pressure, and a magnetic electronic valve 133 operated by means of said pressure sensor 132; there is provided an endless track lowering/lifting system consisting of a button switch 134 for lowering/lifting said endless tracks 7 as wanted by the operator, and a magnetic electronic valve 135 selectively operated by said button switch 134; and said systems are operatively connected to said hydraulic cylinders 30, thereby constituting said power transmitting mechanism, said automobile turning mechanism and said lowering/lifting mechanism in a parallel and combined form.

3. The multi-purpose auxiliary track mechanism for

automobile as claimed in claim 1, wherein said driving mechanism including a speed shifting means is constituted such that: a gear case 57 having a room 56 is installed at the centre of said front supporting beam 1a of said supporting frame 2; a hollow space 1c' of a middle supporting beam 1c of said supporting frame 2 and said room 56 are let to communicate each other; a hollow space 1a' of said front supporting beam 1a and said room 56 are let to communicate each other; a connecting driving shaft 59 is installed within said hollow space 1c' of said middle supporting beam 1c, in a state supported by bearings 58, 58' of the opposite sides; the opposite ends of said connecting driving shaft 59 are disposed respectively within said room 23 of said lower gear case 26 and within said room 56 of said gear case 57; bevel gears 60, 61 are fixedly installed at the opposite ends of said connecting driving shaft 59; said bevel gear 60 is meshed with another bevel gear 48 of said revolution shaft 45; said driving shafts 62, 62' are respectively provided with outside splines 63, 63' at the ends thereof; said driving shafts 62, 62' are supported by bearings 64, 64' which are installed

within the hollow space of said supporting beam 1a; power transmission adjusting members 65, 65' are installed at the opposite sides of said room 56 of said gear case 57 in such a manner as to be meshed with said connecting splines 63, 63' of said driving shafts 62, 62'; bearings 66, 66' are installed between the inner wall of said gear case 57 and said power transmission adjusting members 65, 65' so as for said members 65, 65' to be rotatably secured; at the other ends of said power transmission adjusting members 65, 65', there are provided friction faces 67, 67', connecting splines 68, 68' and shaft retaining portions 69, 69' in the cited order; a plurality of pressing rods 71 having securing pieces 70, 70' are installed through said friction faces 67, 67'; a compression spring 72 is installed on the projected portion of each of said pressing rods 71, in a state supported by said securing piece 70; disc shaped pressing plates 73, 73' are respectively inserted behind said securing piece 70'; between said pressing plates 73, 73' and friction faces 67, 67', there are disposed discs 75, 75' with connecting splines 74, 74' formed at the centres thereof; a power transmitting

shaft 79 is provided with a bevel gear 76 in an integral form at an end thereof, and with supporting ends 77, 77' and connecting splines 78, 78' on the opposite end portions thereof; said bevel gear 76 is meshed with said bevel gear 61 of said connecting driving shaft 59; at the other end of said power transmitting shaft 79, there is installed a bevel gear 84 having an inside spline 81 so as for it to be meshed or detached to and from said connecting spline 78' of said power transmitting shaft 79, and also having a connecting portion 83 with an outside spline 82 formed on it; a ratchet hook 85 is attached to the tip of said bevel gear 84; on said connecting portion 83 of said bevel gear 84, there is fitted an actuating ratchet 88 having an inside connecting spline 86 for being meshed with said connecting spline 82 of said connecting portion 83 of said bevel gear 84, and also having an outside spline 87 so as to be meshed or detached to and from said connecting spline 74' of said disc 75' and said connecting spline 68' of said power transmission adjusting member 65'; a ratchet hook 89 is fixedly installed on the outer circumferential surface of said actuating ratchet 88; on said connecting spline 78, there is fitted an actuating

ratchet 92 having an inside connecting spline 90 so as for it to be meshed or detached to and from said connecting spline of said power transmitting shaft 79, and also having an outside spline 91 so as for it to be meshed or detached to and from said connecting spline 74 of the centre of said disc 75 and said connecting spline 68 of said power transmission adjusting member 65; a ratchet hook 93 is fixedly installed on the outer circumferential surface of said actuating ratchet 92; actuating bars 94a, 94b, 94c are extended from said ratchet hooks 85, 89, 93 which are fixedly secured to said actuating ratchets 88, 92 and the bevel gear 84; rotating bars 95a, 95b, 95c are let to pass through the opposite side walls of said gear case 57, in a state supported by said opposite walls; the tips of actuating bars 94a, 94b, 94c are respectively connected to said rotating bars 95a, 95b, 95c; the end portions of said rotating bars 95a, 95b, 95c are exposed to the outside of said gear case 57 to be respectively connected to pivoting pieces 96a, 96b, 96c; there is provided a hydraulic system including hydraulic cylinders 97a, 97b, 97c with their actuating rods 97a', 97b', 97c' connected to said pivoting pieces

96a, 96b, 96c, and adjusting pieces 99, 99' having actuating rods 98, 98'; said hydraulic system further includes a speed shifting lever box 102 having a guide slot 100, and having a speed shifting lever 101 installed through said guide slot and between said adjusting pieces 99, 99', with an adjusting bar 101' being provided on said speed shifting lever 101; said hydraulic system further includes operating valves 103, 103' operated by means of said speed shifting lever 101 and a rotary connecting unit 9'; said hydraulic system is connected to said actuating cylinders 97a, 97b, 97c so as for the revolving power of said output shaft 14 to be transmitted to said driving sprockets 6 after a proper variation of the revolution speed; oil passage terminals 105 are formed at the opposite ends of said front supporting beam 1a of said supporting frame 2; at the ends of said oil passage terminals 105, there are fixedly installed steering brake adjusting members 110 with pressing units 109 closely attached thereon; a steering brake plate 112 is disposed between each pair of said pressing units 109; said steering brake plates 112 are firmly and fixedly secured to said driving

shafts 62, 62'; the opposite ends of said steering brake adjusting rod 113 are connected between said hydraulic cylinders 114, 114', in this state, an installing plate 115 being firmly and fixedly installed at the lower and of a handle shaft 116; a pinion 117 is fixedly installed on said handle shaft 116; a rack 118 is provided at the centre of said steering brake adjusting rod 113 in order to mesh said rack 118 with said pinion 117; said hydraulic cylinders 114, 114' and said steering brake adjusting members 110 of the opposite ends of said front supporting beam 1a are interconnected by means of a hydraulic tube 119; said steering brake plates 112 fixedly attached on said driving shafts 62, 62' are respectively pressed by said pressing units 109 which are in turn pressed by the oils which are selectively introduced in accordance with the rotating direction of said handle shaft 116; and consequently, the revolution number of one of said driving shafts 62, 62' is properly reduced, thereby forming said driving mechanism having a speed shifting means.

4. A multi-purpose auxiliary track mechanism, substantially as described.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number 9021502.1

Relevant Technical fields

(i) UK Cl (Edition K) B7H (HB, HMJ, HMM)

(ii) Int Cl (Edition 5) B62D 55/04

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

J L TWIN

Date of Search

04.11.1990

Documents considered relevant following a search in respect of claims

1

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	EP 0060209 A1 (HILDERBRAND) see eg Figure 6	1
X	GB 450748 (KEGRESSE)	1
X	GB 355553 (BREWER)	1
X	GB 288695 (VICKERS)	1
X	GB 280301 (VICKERS)	1
X	US 4541498 (PITCHFORD)	1
X	US 4204583 (TOYOURA ET AL) see eg column 6 lines 4-20	1
X	US 3062327 (DEBUS)	1
A	US 2714933 (HARRIS)	1

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